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SECOND ANNUAL MEETING OF THE ASSOCIATION.

The second annual meeting of the Mathematical Association of America was held at Hamilton Hall, Columbia University, New York City, on Thursday, Friday and Saturday, December 28–30, 1916, in affiliation with the American Association for the Advancement of Science. There were 184 persons present at the various meetings, including 141 members of the Association as follows:

Joseph Allen, College of the City of New York, New York, N. Y.
R. B. Allen, Kenyon College, Gambier, Ohio.
R. C. Archibald, Brown University, Providence, R. I.
C. H. Ashton, University of Kansas, Lawrence, Kan.
Clara L. Bacon, Goucher College, Baltimore, Md.
Ida Barney, Smith College, Northampton, Mass.
L. A. Bauer, Carnegie Institution, Washington, D. C.
R. D. Beetle, Dartmouth College, Hanover, N. H.
C. A. Bergstresser, Boys' High School, Brooklyn, N. Y.
Harry Birchenough, N. Y. State College for Teachers, Albany, N. Y.
G. D. Birkhoff, Harvard University, Cambridge, Mass.
Vevia Blair, Graduate School, Columbia University, New York, N. Y.
Joseph Bowden, Adelphi College, Brooklyn, N. Y.
J. W. Bradshaw, University of Michigan, Ann Arbor, Mich.
E. W. Brown, Yale University, New Haven, Conn.
H. S. Brown, Hamilton College, Clinton, N. Y.
T. H. Brown, Brown University, Providence, R. I.
Daniel Buchanan, Queen's University, Kingston, Ontario, Can.
H. E. Buchanan, University of Tennessee, Knoxville, Tenn.
W. G. Bullard, Syracuse University, Syracuse, N. Y.
R. W. Burgess, Brown University, Providence, R. I.

- W. D. Cairns, Oberlin College, Oberlin, Ohio.
Florian Cajori, Colorado College, Colorado Springs, Col.
J. A. Caparo, University of Notre Dame, Notre Dame, Ind.
F. E. Carr, Oberlin College, Oberlin, Ohio.
W. B. Carver, Cornell University, Ithaca, N. Y.
Mary E. Caster, Paterson, N. J.
J. W. Clawson, Ursinus College, Collegeville, Pa.
A. B. Coble, Johns Hopkins University, Baltimore, Md.
Abraham Cohen, Johns Hopkins University, Baltimore, Md.
E. C. Cook, College of the City of New York, New York, N. Y.
J. L. Coolidge, Harvard University, Cambridge, Mass.
Elizabeth B. Cowley, Vassar College, Poughkeepsie, N. Y.
Louise D. Cummings, Vassar College, Poughkeepsie, N. Y.
C. H. Currier, Brown University, Providence, R. I.
C. N. Dickinson, Hollins College, Hollins, Va.
C. E. Dimick, U. S. Coast Guard Academy, New London, Conn.
Eleanor C. Doak, Mount Holyoke College, South Hadley, Mass.
H. R. Dougherty, N. Y. Military Academy, Cornwall-on-Hudson, N. Y.
C. R. Duncan, Massachusetts Agricultural College, Amherst, Mass.
T. W. Edmondson, New York University, New York, N. Y.
L. P. Eisenhart, Princeton University, Princeton, N. J.
L. C. Emmons, Michigan Agricultural College, East Lansing, Mich.
T. C. Esty, Amherst College, Amherst, Mass.
G. W. Evans, Charlestown High School, Boston, Mass.
F. C. Ferry, Williams College, Williamstown, Mass.
H. B. Fine, Princeton University, Princeton, N. J.
C. A. Fischer, Columbia University, New York, N. Y.
T. S. Fiske, Columbia University, New York, N. Y.
J. D. Flynn, Trinity College, Hartford, Conn.
T. M. Focke, Case School of Applied Science, Cleveland, Ohio.
W. B. Ford, University of Michigan, Ann Arbor, Mich.
W. S. Franklin, South Bethlehem, Pa.
A. S. Gale, Rochester University, Rochester, N. Y.
W. V. N. Garretson, University of Michigan, Ann Arbor, Mich.
O. E. Glenn, University of Pennsylvania, Philadelphia, Pa.
Matilda Goertz, New York, N. Y.
T. E. Gravatt, Pennsylvania State College, State College, Pa.
G. M. Green, Harvard University, Cambridge, Mass.
C. C. Grove, Columbia University, New York, N. Y.
H. V. Gummere, Drexel Institute, Philadelphia, Pa.
M. W. Haskell, University of California, Berkeley, Cal.
H. E. Hawkes, Columbia University, New York, N. Y.
Olive C. Hazlett, Bryn Mawr College, Bryn Mawr, Pa.
E. R. Hedrick, University of Missouri, Columbia, Mo.

- A. A. Himwich, Physician, New York, N. Y.
F. C. Hodgson, Publisher, New York City, N. Y.
F. J. Holder, University of Pittsburgh, Pittsburgh, Pa.
L. S. Hulburt, Johns Hopkins University, Baltimore, Md.
E. V. Huntington, Harvard University, Cambridge, Mass.
W. A. Hurwitz, Cornell University, Ithaca, N. Y.
Dunham Jackson, Harvard University, Cambridge, Mass.
G. H. Jamison, State Normal School, Kirksville, Mo.
S. A. Joffe, Assistant Actuary, New York, N. Y.
Edward Kasner, Columbia University, New York, N. Y.
Edward Kircher, Harvard University, Cambridge, Mass.
E. H. Koch, Jr., High School of Commerce, New York, N. Y.
K. W. Lamson, Graduate School, University of Chicago, Chicago, Ill.
Florence P. Lewis, Goucher College, Baltimore, Md.
G. H. Ling, University of Saskatchewan, Saskatoon, Can.
Joseph Lipka, Massachusetts Institute of Technology, Cambridge, Mass.
L. L. Locke, Brooklyn Training School for Teachers, Brooklyn, N. Y.
W. R. Longley, Yale University, New Haven, Conn.
Emilie N. Martin, Mt. Holyoke College, South Hadley, Mass.
James McClay, Columbia University, New York, N. Y.
Helen A. Merrill, Wellesley College, Wellesley, Mass.
Mansfield Merriman, Consulting Engineer, New York, N. Y.
E. J. Miles, Yale University, New Haven, Conn.
Bessie I. Miller, Rockford College, Rockford, Ill.
G. A. Miller, University of Illinois, Urbana, Ill.
J. A. Miller, Swarthmore College, Swarthmore, Pa.
J. S. Miller, Emory and Henry College, Emory, Va.
H. B. Mitchell, Columbia University, New York, N. Y.
F. M. Morgan, Dartmouth College, Hanover, N. H.
Frank Morley, Johns Hopkins University, Baltimore, Md.
Richard Morris, Rutgers College, New Brunswick, N. J.
B. L. Newkirk, University of Minnesota, Minneapolis, Minn.
E. J. Oglesby, College of William and Mary, Williamsburg, Va.
G. D. Olds, Amherst College, Amherst, Mass.
F. W. Owens, Cornell University, Ithaca, N. Y.
George Paaswell, Civil Engineer, New York, N. Y.
Alexander Pell, South Hadley, Mass.
Anna J. Pell, Mount Holyoke College, South Hadley, Mass.
A. D. Pitcher, Western Reserve University, Cleveland, O.
W. R. Ransom, Tufts College, Tufts College, Mass.
H. W. Reddick, Cooper Union, New York, N. Y.
Emma M. Requa, Hunter College, New York, N. Y.
R. G. D. Richardson, Brown University, Providence, R. I.
H. L. Rietz, University of Illinois, Urbana, Ill.

R. B. Robbins, Yale University, New Haven, Conn.
 E. D. Roe, Jr., Syracuse University, Syracuse, N. Y.
 R. E. Root, U. S. Naval Academy, Annapolis, Md.
 D. A. Rothrock, Indiana University, Bloomington, Ind.
 Mary E. Sinclair, Oberlin College, Oberlin, O.
 H. E. Slaughter, University of Chicago, Chicago, Ill.
 Clara E. Smith, Wellesley College, Wellesley, Mass.
 D. E. Smith, Columbia University, New York, N. Y.
 P. F. Smith, Yale University, New Haven, Conn.
 Sarah E. Smith, Mount Holyoke College, South Hadley, Mass.
 W. M. Smith, Lafayette College, Easton, Pa.
 Jessie Spearing, Graduate School, Columbia University, New York, N. Y.
 J. M. Stetson, Western Reserve University, Cleveland, Ohio.
 H. D. Thompson, Princeton University, Princeton, N. J.
 F. C. Touton, Central High School and Junior College, St. Joseph, Mo.
 A. B. Turner, College of the City of New York, New York, N. Y.
 J. N. Van der Vries, University of Kansas, Lawrence, Kan.
 Oswald Veblen, Princeton University, Princeton, N. J.
 Evelyn Walker, Hunter College, New York, N. Y.
 C. B. Walsh, Ethical Culture High School, New York, N. Y.
 J. H. Weaver, High School, West Chester, Pa.
 H. E. Webb, Central High School, Newark, N. J.
 Louisa M. Webster, Hunter College, New York, N. Y.
 A. L. Wechsler, New York City, N. Y.
 Mary E. Wells, Vassar College, Poughkeepsie, N. Y.
 E. E. Whitford, College of the City of New York, New York, N. Y.
 F. B. Williams, Clark University, Worcester, Mass.
 A. H. Wilson, Haverford College, Haverford, Pa.
 E. B. Willson, Massachusetts Institute of Technology, Cambridge, Mass.
 F. N. Wilson, Princeton University, Princeton, N. J..
 J. W. Young, Dartmouth College, Hanover, N. H.
 Mabel M. Young, Wellesley College, Wellesley, Mass.

The meeting opened with a joint session of the Association with the American Mathematical Society, Section A of the American Association for the Advancement of Science, and the American Astronomical Society, about two hundred being present. The retiring president of the American Mathematical Society, Professor Ernest W. Brown, of Yale University, gave his presidential address on "The relations of mathematics to the natural sciences." This was followed by the retiring address of Professor Armin O. Leuschner of the University of California, vice-president of Section A of the American Association. In the absence of Professor Leuschner, the address, entitled "Derivation of orbits—theory and practice," was read by Professor M. W. Haskell. This session, like those of Friday and Saturday, was held in Room 301, Hamilton Hall.

A joint dinner of these four organizations was held Thursday evening at the

Park Avenue Hotel. Following the dinner, which was attended by 142 persons, Professor L. P. Eisenhart, vice-president of Section A of the American Association, introduced the following speakers: Professor Florian Cajori, Colorado College; President R. J. Aley, University of Maine; Mr. William Bowie, U. S. Coast and Geodetic Survey; Professor J. A. Miller, Swarthmore College; Mr. G. A. Plimpton, New York City; and Professor Dunham Jackson, Harvard University.

A valuable feature in connection with the meeting was the opportunity afforded on Friday from twelve until two o'clock to visit the famous collection of portraits and medals of mathematicians gathered by Professor David Eugene Smith. The Association is under obligation to Professor Smith.

An appropriate resolution was adopted by the Council, recognizing the courtesy of the department of mathematics of Columbia University, the able work of the program committee in preparing so attractive a program, and the convenience of the facilities provided by the committee on arrangements.

The meetings of the Association continued on Friday morning. The following program was carried out, in accordance with the plan as arranged by the committee under the chairmanship of Professor David Eugene Smith, of Columbia University. At the request of President Hedrick, the chair was occupied for part of Friday morning by Vice-President Huntington and on Saturday morning by President-elect Cajori. Professor J. N. Van der Vries, chairman of the department of institutional delegates, presided at their meeting on Friday afternoon.

Friday Morning.

- (1) "Discussions of Fluxions from Berkeley to Woodhouse." PROFESSOR FLORIAN CAJORI, Colorado College.
- (2) "University Courses in Mathematics Intended for Teachers of Secondary Mathematics." PROFESSOR M. W. HASKELL, University of California.
- (3) Discussion, led by PROFESSOR J. W. YOUNG, Dartmouth College, and PROFESSOR EDWARD KASNER, Columbia University.

Friday Afternoon.

- (4) Meeting of Institutional Delegates. (See page 56.)
 "A Nucleus for a Mathematical Library." DR. T. H. GRONWALL, New York, N. Y. (Introduced by Professor Oswald Veblen.)
 Report of the Library Committee. PROFESSOR W. B. FORD, University of Michigan, Chairman.

Saturday Morning.

- (5) "The Mathematics of Aërodynamics." PROFESSOR E. B. WILSON, Massachusetts Institute of Technology.
 Discussion by PROFESSOR A. G. WEBSTER, Clark University.

The address of Professor Cajori clothed the dry bones of a somewhat remote controversy in the history of mathematics with an enlivening interest that showed his mastery as a writer of history.

Professor Haskell's paper forms an important contribution to a topic that is at present the object of much study on the part of university and college teachers. It aroused a lively discussion not merely by the two appointed to lead, but by a number of others who either criticized the views of the previous speakers or reported on plans now in operation similar to the one given by Professor Haskell.

In accordance with the policy already established of giving at our meetings one or more reports on the activities of committees of the Association, the Library Committee, appointed in June by President Hedrick, made a report on the plans which it has already formed. The report is printed in full on page 56.

Professor Wilson's paper on Saturday morning added a new phase to the programs of the Association, giving an exposition of the mathematics used in an important and rapidly growing science.

Abstracts are printed below for the papers and the principal discussions, so far as these are available. These are numbered to correspond with the numbers on the program above.

ABSTRACTS OF PAPERS.

(1) Professor Cajori's address, "Discussions of Fluxions from Berkeley to Woodhouse," contained brief accounts of Berkeley's *Analyst* and of three controversies carried on in Great Britain during the eighteenth century on the subject of fluxions. Particular attention was given to Berkeley's rejection of infinitely small quantities, Berkeley's criticism of Newton's derivation of the "moment" of a rectangle, and to Berkeley's "lemma": If in a demonstration an assumption is made, by virtue of which certain conclusions follow, and if afterward that assumption is destroyed or rejected, then all the conclusions that had been reached by the first assumption must also be destroyed or rejected. Berkeley's opponents would not accept this lemma. Robert Woodhouse in 1803 openly and fully accepted it. Rejoinders to Berkeley's *Analyst* were made by James Jurin of Cambridge and John Walton of Dublin. A second controversy on the nature of Newton's fluxions and limit-concept was carried on between James Jurin on one side, and Benjamin Robins and Pemberton on the other. Jurin believed that Newton's variables reached their limits; Robins insisted that a variable cannot reach its limit, and developed the calculus without using infinitely small quantities. This debate constitutes the most thorough discussion of limits of that time. The controversy lasted two years, gave rise to twenty articles which filled over 700 printed pages. Maclaurin's *Fluxions*, 1742, met deservedly with high appreciation, but except in the last part of the text, it did not use any notation for the new analysis; its rhetorical form of exposition made it unattractive reading. The advances in the logical exposition of the calculus in Great Britain were made during the eight years immediately following the publication of the *Analyst*. A third controversy took place in 1850-1852; friends of Emerson were arrayed against friends of Simpson. The discussion was carried on in the *Ladies Diary*, in some other journals less widely known, and in a pamphlet, *Truth Triumphant or Fluxions for the Ladies, showing the cause to be before the effect*, etc. This is the least important of the three controversies.

Towards the latter part of the eighteenth century the efforts at rigorous exposition slackened. Maclaurin was seldom read and Robins was forgotten. The first three editions of the *Encyclopædia Britannica* defined a "fluxion" as an "increment" acquired in "less than any assigned time." Both before and after the period of eight years, 1834-1842, there existed during the eighteenth century in Great Britain a mixture of Continental and British conceptions of the new calculus, a superposition of British symbols and phraseology upon the older Continental concepts. Newton's notation was poor and Leibniz's philosophy of the Calculus was poor. The mixture represented the temporary survival of the least fit of both systems. The subsequent course of events was in the opposite direction; the Leibnizian notation and phraseology was superposed upon the limit-concept as developed by Newton, Jurin, Robins, Maclaurin, D'Alembert and later writers. Woodhouse was the first Englishman to acknowledge openly the great services rendered by Bishop Berkeley in criticizing the philosophical conception of the calculus prevalent at that time. Woodhouse was the forerunner in Cambridge of Babbage, Peacock and the younger Herschel, in the promotion of the principles of pure D-ism in opposition to the dot-age of the university.

(2) Professor Haskell's paper is promised for printing in full in the March issue.

(3) In lieu of an abstract which was not obtainable in time for printing here, Professor Kasner set forth the appreciation of the research aspect of mathematics as the primary requirement of the teacher. This is best acquired by a course in original problems, composed mainly by the students themselves and as closely related to general science and life as possible. New concepts should be introduced by *difficult* interesting problems, easy ones to be discussed later. General scientific method and historical perspective should be emphasized. The teacher's mind must be liberal and flexible; the rough procedure of common sense, the finest logical criticism, and all intermediate stages, should be appreciated sympathetically.

Taking as his point of departure, Professor Haskell's question: "What is geometry?", Professor Young affirmed that teachers of mathematics must make clear to themselves the answer to the question: "What is mathematics?" What is needed is not a formal definition; but a working knowledge, in order that teachers may see clearly what they are trying to accomplish. Judging by prevailing practice in the teaching of algebra, where from 75 per cent. to 90 per cent. of the time is devoted to the development of proficiency in manipulating symbols, one would say that such technical skill is the teacher's conception of what constitutes algebra. Yet no wide-awake teacher would deny that such manipulatory expertness is only an incident and not the real substance of algebra. What then is the real substance of algebra? Courses in algebra must be so reorganized that there would be no need of asking the question. Pending that time, courses for prospective teachers, as outlined by Professor Haskell, must equip the teacher to formulate his answer. It is for this reason that

emphasis on the history of mathematics is justified,—but the history must be taught not primarily to gain information, but rather to develop an insight into the spirit of mathematical enquiry. One result of such insight will be to banish the obsession that mathematical thinking is *deductive*. It is not—every one who has stopped to think about the way he reaches a solution of a mathematical problem knows that in the majority of cases his thinking was not primarily deductive. This obsession is largely responsible for the unnecessary formalism with which our subject is branded. Finally, Professor Young expressed the opinion that sufficient place is not given to the applications of mathematics in Professor Haskell's scheme of courses.

(4) The meeting of institutional delegates is reported below.

(5) Professor Wilson pointed out that there are at least three stages in the growth of a branch of engineering: (1) the initiation by bold adventurers, (2) the development of a mathematical theory, (3) the codification in texts and handbooks. Aëronautical engineering is at present in stage (2), and properly qualified mathematicians like G. H. Bryan and Sir Geo. Greenhill have aided materially in advancing the art. Particular mention was made of the modifications and adaptations of the purely theoretical work which have been introduced by L. Bairstow in England and by J. C. Hunsaker in this country, by virtue of which experimental results may be combined with the methods of mathematicians to develop really accurate principles of airplane design.

Professor Wilson showed that apart from the purely elementary methods of algebra and trigonometry, the branches of mathematics used in aëronautical theory are: (1) The principles of mechanics including moving axes, (2) linear differential equations with constant coefficients, (3) theory of functions of a complex variable. Emphasis was laid on the need of so teaching the theory of functions that it becomes a practically usable branch of mathematics, and of devoting more time to the study of mechanics and mathematical physics, to the end that mathematicians might contribute more to the national defense both in periods of preparation and in crises of adversity.

This paper was discussed by Professor A. G. Webster, of Clark University, in his inimitable manner. The discussion was also participated in by Director L. A. Bauer, of the Carnegie Institution of Washington, and by Dr. W. S. Franklin, of South Bethlehem, Pa. Professor Ernest W. Brown, whose name appeared upon the stated program, was unavoidably prevented from attendance at this session.

MEETING OF INSTITUTIONAL DELEGATES.

The meeting of delegates representing those colleges and universities holding institutional membership was held Friday afternoon at two o'clock. Professor J. N. Van der Vries, of the University of Kansas, had been chosen at the summer meeting as chairman of this department, and as such was in charge of the meeting. It was announced at the morning program that the meeting was to be an open

session and that all were welcome who were interested in the institutional questions which form the special sphere of the activities of this department. The general topic proposed by a special committee for consideration at this meeting was that of mathematical libraries, the best selection of books for a small library of 200, 300, or 500 volumes, and related questions. This topic grew naturally out of the discussion at the summer meeting, and the interest which it evoked is one of several indications of the growing importance attaching to the department of institutional delegates. According to the roll-call made by the secretary, the following 29 institutions were represented by official delegates:

Amherst College, Professor T. C. Esty;
Brooklyn Polytechnic Institute, Dr. J. B. Chittenden;
Brown University, Professor R. G. D. Richardson;
University of Buffalo, Professor W. H. Sherk;
Case School of Applied Science, Professor T. M. Focke;
University of Chicago, Professor H. E. Slaught;
Colorado College, Professor Florian Cajori;
Columbia University, Professor T. S. Fiske;
Cooper Union, Professor H. W. Reddick;
Creighton University, Professor W. F. Rigge;
Dartmouth College, Professor J. W. Young;
Hamilton College, Professor H. S. Brown;
University of Kansas, Professor J. N. Van der Vries;
Kenyon College, Professor R. B. Allen;
Lafayette College, Professor W. M. Smith;
University of Michigan, Professor W. B. Ford;
University of Missouri, Professor E. R. Hedrick;
Mount Holyoke College, Professor Sarah E. Smith;
College of the City of New York, Professor Joseph Allen;
N. Y. State College for Teachers, Professor Harry Birchenough;
New York University, Professor T. W. Edmondson;
Oberlin College, Professor W. D. Cairns;
Princeton University, Professor H. B. Fine;
Rockford College, Professor Bessie I. Miller;
Rutgers College, Professor Richard Morris;
Trinity College, Professor J. D. Flynn;
Wellesley College, Professor Helen A. Merrill;
Wesleyan University, Professor L. A. Howland;
Western Reserve University, Professor A. D. Pitcher.

There were also present members of the faculties of other institutions including the following: Bryn Mawr College, Clark University, Cornell University, Emory and Henry College, Goucher College, Harvard University, Hunter College, University of Indiana, Johns Hopkins University, University of Pittsburgh, Syracuse University, Tufts College, Vassar College, and Yale University.

Inasmuch as the value of Dr. Gronwall's paper consisted most of all in the list of books which he has drawn up, a list which must be seen to be fully appreciated, he did not attempt to read it but his presentation took the form of brief comments upon the principles underlying the selection of the list. Dr. Gronwall's list of books will be printed later, probably in connection with a further report of the Library Committee and at a point where its usefulness will be enhanced by its logical association with two or three other lists now in the process of formation.

PRELIMINARY REPORT OF THE LIBRARY COMMITTEE.

The Library Committee, which consists of Professor W. B. FORD, Chairman, and Professors FLORIAN CAJORI, E. S. CRAWLEY, SOLOMON LEFSCHETZ, W. R. LONGLEY, and R. E. ROOT, made the following report:

The relation which the Association has, or may be made to have in the near future, to the mathematical libraries of our schools and colleges at once presents a decidedly real and many sided problem. That the Association can render valuable service in this direction was early recognized by the President and others identified with him in the inception of the organization, and later the present committee was asked to arrive if possible at some definite plans for effectively carrying out such work. The committee can as yet make no final report, but it can set forth a number of suggestions which it has received from various sources and of which it fully approves. It is planned to develop these suggestions in the near future so as to put them upon an actual working basis. Meanwhile further suggestions will be most gratefully received, especially from those members who are engaged in schools and colleges where the need of better library advantages is distinctly felt.

The suggestions received are as follows:

1. That the committee prepare certain lists of books and publish them in the MONTHLY. To be more specific, it has been suggested that lists be prepared suitable for freshmen, sophomores, juniors, etc., the object being to furnish each of these classes of students with appropriate collateral reading in connection with their regular mathematical courses, and in a more general sense to furnish certain side lights upon the mathematics belonging to these various periods of study. Such lists should be relatively short and, where conditions permit, the books indicated might well be kept in the actual class room where, if properly shelved and labelled, they would at least attract attention and have a general salutary effect.

Besides the lists just mentioned, it has been suggested that a list of reference books be prepared suitable for purchase by a general college library. Such a list would naturally be relatively long, indicating what the college could well endeavor to accumulate in the course of several years. By way of general lists of a shorter nature, it might be proper also for the committee to work up a "five-foot shelf" of mathematics for colleges and possibly another such shelf for high schools.

The preparation of these various lists, if carefully done, will evidently require some time. It is the intention of the committee to proceed in this direction as

fast as possible and eventually make known its findings in the MONTHLY. How far it would be wise to confine the lists to books in the English language is a question upon which the committee would be glad to have the opinion of all interested persons.

2. It has been suggested that the Association, through its library committee, should form a sort of medium of exchange for books and periodicals. For example, one college may have material, such as duplicates of books, which it does not need but which would be of value to some other school or college. In such cases the Association should be in a position to assist the exchange, more especially in expediting and rendering it less artificial than at present. Such exchanges, though already common among colleges and universities for material in general, could doubtless be accomplished, so far as mathematics is concerned, in a much more effective way than at present, and the medium of publicity afforded by the MONTHLY could evidently be used to much advantage in this direction. If this idea proves valuable, the function of the committee would seem to be that of conducting a clearing house for such material, using the columns of the MONTHLY as may seem desirable.

In connection with this matter of exchanges, it seems clear that the Association should keep on file in its library copies of all American journals and periodicals such as are devoted to college or high-school mathematics, and that these should be ready for loaning out to members as desired. For the sake of completeness, the back volumes of such periodicals, whenever procurable, should at once be secured. Eventually, the question of obtaining foreign periodicals will also need consideration. Teachers in the small colleges do not ordinarily have access to foreign periodicals of this kind except as they borrow them from the large universities which in turn prefer not to loan material of this kind. So it seems highly desirable that, as soon as conditions abroad permit, the Association should arrange to have on file in its library a complete set of the French, Italian, German and British journals dealing with collegiate and high-school mathematics, including their history.

3. Mention has just been made of the Association library, but it must be admitted that only the beginnings of such a library are as yet in existence. It will be the evident duty of the committee to do whatever it can to build up such a library. As soon as it begins to take definite shape, rules for its administration will need to be formulated. In this connection, the precedents already established by the library of the American Mathematical Society and which have proved altogether satisfactory there will naturally suggest the course to be followed in the present instance. In particular, authors should be encouraged at all times to present copies of their publications to the library, and individuals generally should feel that whatever aid they can lend to the enterprise will be very gratefully received.

4. Various other suggestions reaching the committee but as yet remaining in a somewhat embryonic state are the following:

(a) That the Association through the library committee lend its influence

to the formation of mathematical reading circles throughout the country. No doubt the committee should at least be in position to suggest a suitable group of books for the study of any one topic which it may be desired to read in this way.

(b) That means be devised if possible whereby publishing houses will become interested in the general activities of the library and donate books to it by way of advertisement.

In conclusion, it would seem that the phenomenal interest and growth attending the first year of the Association portends a corresponding early and substantial development of its library and of the general library interests of all its members. The committee can but hope to aid in all possible ways to bring this about and at the present time any suggestions to this end beyond those mentioned above would be very gratefully received. These should be sent to the chairman, Professor W. B. Ford, 904 Forest Avenue, Ann Arbor, Mich.

Following the reading of the report by Professor Ford, a number of persons spoke. Professor Huntington emphasized the great value of the contemplated plans of the committee and the usefulness in particular of check lists of books in the libraries of our institutions of learning. Professor Richard Morris said that inspired by the action of the teachers of the public schools of New Jersey, the state librarian at Trenton had expressed his willingness to furnish books called for by the teachers. Professor F. J. Holder told of similar aid afforded by the Carnegie libraries, and Professor J. N. Van der Vries reported the services rendered to institutions of the middle west by the John Crerar Library of Chicago.

In contrast to the selection by Dr. Gronwall of a number of books in foreign languages, Professor R. B. Allen urged that most of the books for students should be in English, inasmuch as those interested in mathematics have not so large an interest or ability in languages. Professor W. R. Ransom suggested that where foreign books are put into such lists, there should be an indication of their size, difficulty, and accessibility. Professor W. A. Hurwitz remarked that while many satisfactory texts in elementary subjects exist in English, there is a dearth of texts in English for intermediate courses, and that, when there are no English books of the desired sort, the presence of foreign books in these lists will arouse publishers to a sense of the desirability of publishing such books.

Professors H. E. Slaught and H. E. Hawkes spoke of mathematical clubs and of the selection of a good list of topics for these clubs to be used in connection with appropriate references to available books. When the latter told of thirty or forty topics which have actually been used at Columbia University during the past few years, he was requested by the meeting to publish in the MONTHLY this list together with the accompanying references to accessible sources. Two or three others spoke in regard to the exchange of books and on reading circles.

It was voted that the report of the Library Committee be placed on file for publication, and that the committee be encouraged to continue in its valuable work.

It was voted that the general program committee for the next meeting of the

Association be asked to make a suitable place on its program for such topics as are of institutional interest, and that, if occasion require any decision by formal vote, an executive session of the institutional delegates be held. The meeting then adjourned to make way for the annual business meeting.

ANNUAL BUSINESS MEETING.

The Secretary-Treasurer reported the death during the year of the following ten charter members of the Association:

- L. L. Conant, John E. Sinclair Professor of Mathematics, Worcester Polytechnic Institute.
- W. C. Esty, Professor of Mathematics, Emeritus, Amherst College.
- F. W. Frankland, Consulting Actuary, New York, N. Y.
- F. P. Hebblethwaite, former Instructor in Mathematics, Northwestern University.
- A. H. Holmes, Lawyer, Brunswick, Me.
- Dr. Emory McClintock, Consulting Actuary, Bay Head, N. J.
- Mrs. Eva S. Maglott, Professor of Mathematics, Ohio Northern University.
- J. C. Rayworth, Assistant Professor of Mathematics. Washington University.
- H. A. Sayre, Professor of Mathematics, University of Alabama.
- A. G. Smith, Head of the Department of Mathematics, University of Iowa.

The election of officers for the year 1917 was conducted both by mail and in person at this meeting, as provided by the constitution.

The tellers (Professor H. E. Hawkes, G. H. Ling, and W. R. Ransom) appointed by President Hedrick reported the result of the balloting as follows:

For President, FLORIAN CAJORI, Colorado College.

For Vice-Presidents, OSWALD VEBLEN, Princeton University, and
D. N. LEHMER, University of California.

For Secretary-Treasurer: W. D. CAIRNS, Oberlin College.

For additional members of the Executive Council to serve until January, 1920:

E. R. Hedrick, University of Missouri,
D. E. Smith, Columbia University,
R. E. Moritz, University of Washington,
Helen A. Merrill, Wellesley College.

A full description of the interest in this election was published in the January MONTHLY.

The secretary-treasurer made his financial report for the year, giving an account of all business transacted for the Association up to the date of December 21, 1916. The report was approved subject to an inspection by the auditing committee (Professors R. G. D. Richardson, H. E. Slaughter, and A. H. Wilson) appointed by the president. This committee made its inspection later in the day, and formally approved the report. This report is printed in full below.

TREASURER'S REPORT FOR THE YEAR 1916.

RECEIPTS.

Balance from 1915 business.....	\$ 958.72
1916 subscriptions.....	\$ 502.86
1916 indiv. memberships..	3,110.90
1916 instit. memberships..	271.60
1916 initiation fees.....	24.00
Sale copies of MONTHLY..	49.15
Sale reprints.....	18.77
Advertising.....	392.00
Exchange.....	2.02
Interest State Savgs. Bk..	39.71
Interest Peoples Bk.....	13.36
Total 1916 receipts.....	<u>4,424.37</u>

Total receipts, 1915-1916..... \$5,383.09

Balance on 1915-1916 business..... \$1,671.47
 Recd. on 1917-1920 business..... 1,281.77

Book balance Dec. 21, 1916..... \$2,953.24

EXPENDITURES.

Publisher's bills.....	\$2,688.19
Paid for reprints.....	13.74
President's office.....	126.65
Managing editor's office.....	108.11
Other editors' postage.....	16.30
Secretary-Treasurer's office:	
Postage.....	\$229.00
Bond.....	5.00
Desk and office supplies..	58.53
Express, telegrams, freight, etc.....	46.72
Clerical work.....	239.35
Printing.....	106.72
Cambridge meeting.....	69.18
Institutional meeting....	<u>4.13</u>

758.63

Total expenditures..... \$3,711.62

Cash on hand..... \$ 3.00
 Checking account..... 1,176.85
 State Savgs. Bk. Co. account..... 1,260.03
 Peoples Bkg. Co. account..... 513.36
 Bank balance Dec. 21, 1916..... \$2,953.24

Approved by auditing committee,

R. G. D. RICHARDSON,
 H. E. SLAUGHT,
 A. H. WILSON.

December 29, 1916.

When the accounts were closed on December 21, 1916, for the purposes of the above record, there remained on the total business for the calendar year 1916 the following items:

BILLS RECEIVABLE.

Advertising.....	\$ 86.86
1916 dues unpaid.....	30.00
Back subscriptions (estim.).....	10.00
Due on reprints.....	1.40
	<u>\$128.26</u>

BILLS PAYABLE (all estimated).

Printing December issue.....	\$250.00
2d-class postage Jan.-March.....	150.00
Printing charter membership list....	200.00
Printing New York program.....	12.00
	<u>\$612.00</u>

It will be seen from this report that the former management of the MONTHLY transferred to the Association \$958.72. With this in mind the Council through its Committee on Finance has set aside one thousand dollars to be kept as a reserve fund. It may be noted also that the business for the calendar year 1916 alone will thus close with a probable balance a little under two hundred dollars, and that more than \$1,200 has already been paid into the treasury on the business of the new year.

MEETING OF THE COUNCIL OF THE ASSOCIATION.

The Council met at nine o'clock Friday morning and held other short meetings between the various sessions of the Association, nine members being present. The principal business transacted is indicated herewith.

(1) The following sixteen institutions, on applications duly certified, were elected to institutional membership, making the total number now 76:

Woman's College of Alabama, Montgomery, Ala.
 Trinity College, Hartford, Conn.
 Boston University, Boston, Mass.
 Mount Holyoke College, South Hadley, Mass.
 Worcester Polytechnic Institute, Worcester, Mass.
 Michigan Agricultural College, East Lansing, Mich.
 Princeton University, Princeton, N. J.
 The Polytechnic Institute, Brooklyn, N. Y.
 Hamilton College, Clinton, N. Y.
 Columbia University, New York, N. Y.
 Rochester University, Rochester, N. Y.
 Union University, Schenectady, N. Y.
 Lafayette College, Easton, Pa.
 Lehigh University, South Bethlehem, Pa.
 Washington and Jefferson College, Washington, Pa.
 Brown University, Providence, R. I.

(2) The following fifteen persons, on applications duly certified, were elected to individual membership, making the total number now 1,064, deducting the number of those who have died during 1916.

J. Q. McNatt, with the Colorado Fuel and Iron Co., Florence, Col.
 W. C. Welling, Trinity College, Hartford, Conn.
 E. B. Miller, University of Kansas, Lawrence, Kan.
 G. A. Osborne, Massachusetts Institute of Technology, Boston, Mass.
 C. A. Shook, Graduate School, Harvard University, Cambridge, Mass.
 Eleanor C. Doak, Mount Holyoke College, South Hadley, Mass.
 Vera L. Wright, University of Minnesota, Minneapolis, Minn.
 C. J. Payne, State Normal School, Cape Girardeau, Mo.
 P. H. Daus, University of New Mexico, Albuquerque, N. M.
 J. B. Rosenbach, Graduate School, University of New Mexico, Albuquerque, N. M.
 Vevia Blair, Graduate School, Columbia University, New York, N. Y.
 Oscar Hoppe, with the American Circular Loom Co., New York, N. Y.
 Louise D. Cummings, Vassar College, Poughkeepsie, N. Y.
 E. A. Painter, The Yeates School, Lancaster, Pa.
 H. M. Manning, Surgeon, U. S. Public Health Service, Charleston, S. C.

(3) A section of the Association was established for Maryland and the

District of Columbia, with the possible inclusion of Virginia. Professor Abraham Cohen, of Johns Hopkins University, is the secretary.

(4) A committee consisting of Professor Huntington, chairman, Professor Cajori and the secretary-treasurer was appointed with power to determine the time and place of the summer meeting, in conference with a similar committee of the American Mathematical Society.

(5) It was voted to appoint a committee which should in conjunction with a similar committee of the Society consider the question of possible assistance for *Revue Semestrielle* and the *Jahrbuch über die Fortschritte der Mathematik*. The committee was empowered to include also in its investigation other international projects of a kind similar to the two named. Mathematicians the country over are feeling increasingly the deplorable influence of the European war as it affects such indispensable aids as the German and French encyclopædias, the two journals above mentioned, and similar reference books. This action has been taken in order that the two great mathematical organizations of America may consider what contribution they may perhaps make in rendering assistance to these valuable journals of record.

(6) It was voted to hold the next annual meeting in Chicago in conjunction with the Chicago meeting of the American Mathematical Society.

(7) In a session following the election of officers, the Council, in pursuance of its constitutional authority to fill vacancies *ad interim*, filled the vacancy caused by the election of Professor Cajori to the presidency by the appointment of Professor E. V. Huntington, to serve until January, 1918.

(8) The members of the Committee on Publications (H. E. Slaughter, managing editor, R. D. Carmichael, and W. H. Bussey) were reappointed for the year 1917.

(9) A Committee on Membership with ex-President Hedrick as chairman was authorized by the Council.

(10) The president-elect was empowered to make the necessary modifications in the existing committees of the Council and to appoint the new committees already authorized. He has accordingly appointed the following:

Committee on Sections: D. E. Smith, Chairman; E. R. Hedrick, M. B. Porter.

Committee on Membership: E. R. Hedrick, Chairman; E. V. Huntington, M. W. Haskell. W. D. CAIRNS, *Secretary-Treasurer*.

ON THE ORIGIN OF CERTAIN TYPICAL PROBLEMS.¹

By DAVID EUGENE SMITH.

One thing which impresses the student of mathematical problems is that several which he would naturally classify as purely fictitious and of the nature of pleasing puzzles apparently had their origin in genuine applications of mathematics to questions of real life. Of these I shall mention only four, although the list could be greatly extended.

¹ Extract from a paper on the History of Mathematical Recreations, read before the Mathematical Association of America at Cambridge, Mass., September 1, 1916.